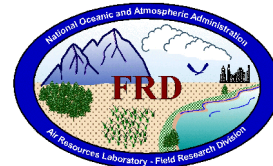


FRD Activities Report March 2001



Research Programs

CBLAST

Work continues on data system upgrades both for the LongEZ system and for the system to be installed on the NOAA P3s in 2002. The re-design, assembly, and testing of two BAT auxiliary boxes is completed. One box is required for each system and houses the power distribution circuit, signal conditioning, and A/D converter boards for 16 channels. The box also supplies an interface to the BAT probe electronics located in the nose of the aircraft. The boxes interface to the data system computer through one parallel and multiple serial ports. The data system consists of a micro-box industrial-type PC chassis housing a 600-MHz Celeron processor on a single-board computer. This system was chosen for both size and ruggedness. Additionally, the SBC/back-plane combination will allow more flexibility for component upgrade in the future. The total weight of the data system, including the primary GPS sensor, is 27 lbs. It is 9 in. (H) x 13.5 in. (W) x 16.5 in (D).



Figure 1. The redesigned FRD aircraft data system. To the left of the main computer is the BAT auxiliary box. On top of the computer is the Ashtech dual frequency GPS. The card in front is a 256 MB PCMCIA flash disk we use for data storage.

Recent upgrades of instruments have led to increased data rates, placing a premium on disk storage and pushing the envelope of disk access. The new system utilizes flash memory on a PCMCIA card through a SCSI interface to read/write data. These removable disks may then be read using any standard laptop computer.

Software upgrades are also part of the new data system. This month, effort focused on writing code to operate the GPS ground station on Linux-based laptop. This continues the effort to translate aspects of the data system (both collection and processing) to operate under the Linux operating system. Work this month also focused on writing IDL code to process aircraft data. Initial programs are being used as analysis tools, but will eventually be used as the main post-processing algorithms. (Jeff.French@noaa.gov)

Hurricane Balloon

The hurricane balloon is capable of adjusting altitude by pumping air into or releasing ballast air from the pressurized ballast section of the balloon. In past testing we have measured the pumping rate and increase in balloon density as a function of balloon pressure and pump voltage. The release rate is not only dependent on the diameter of the ballast release hose, it is also dependent on the length of the hose and any restriction caused by hose connectors, bends or by the release pinch valve. Having a prototype transponder with a fully functional relief valve and a final hose routing configuration, we have

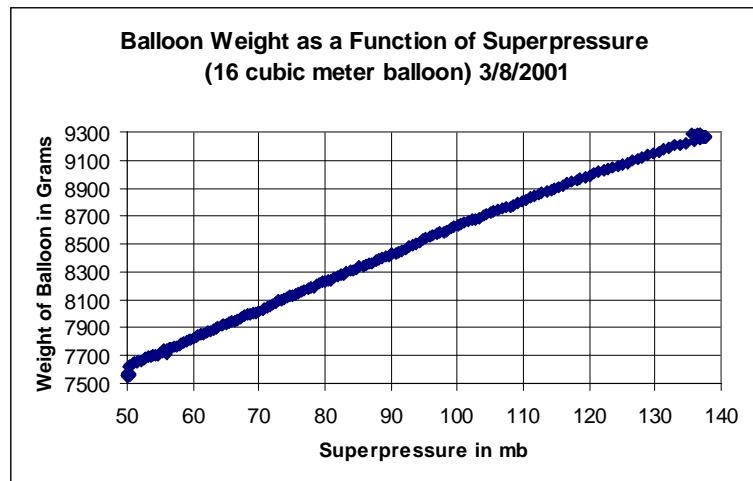


Figure 2. Balloon weight as a function of superpressure.

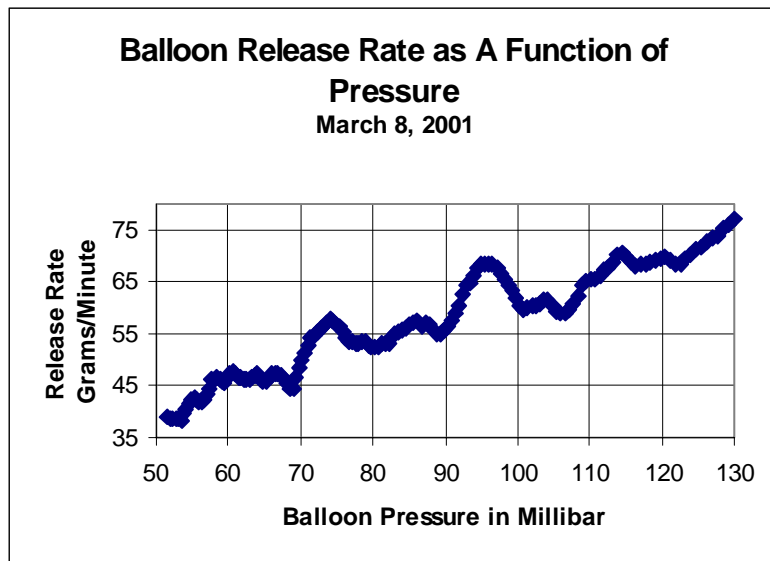


Figure 3. Balloon release rate as a function of pressure.

lift correction needed. (Randy.Johnson@noaa.gov)

AFTAC (GAUNTLET)

The preparations for GAUNTLET are complete. The program will support the efforts of the military in advancing transport and dispersion technology. Deployment to Dugway, UT, is scheduled to begin on the 2nd of April and will continue for three and one-half weeks. The SF₆ release mechanism has been refurbished and built onto a two-axle trailer for mobility. This

will permit rapid redeployment of the mechanism, should meteorological conditions dictate such a move. Training of the participating FRD staff on the use of the mobile analyzers has been completed and the mobile SF₆ analyzers have been installed in three SUV's. The analyzers continue to perform well with the newly installed tritium detectors. New calibration procedures have been developed for the analyzers that ensure greater confidence in the data quality assurance. As a given test proceeds, and multiple single concentration calibrations of the instrument are performed, the percentage of recovery is determined. When the recovery is outside a $\pm 20\%$ limit, the analyzer is placed offline and a new complete calibration is conducted. (Kirk.Clawson@noaa.gov, Roger Carter and staff)

CASES-99

A CASES-99 workshop was held in Boulder, Colorado in late March. A short presentation on the LongEZ data collected during CASES-99 was given on the first day of the workshop. Later, several attendees agreed to look more closely at a ducted gravity wave event that took place on the night of 13-14 October 1999. Several different measurement platforms, including aircraft, remote sensors, and microbarographs saw evidence of these waves. Figure 4 shows the potential temperature profile obtained by the LongEZ at about 0400 local time. The gravity waves appeared to be propagating within the strongly stable layer starting at about 500 m AGL.

(Richard.Eckman@noaa.gov)

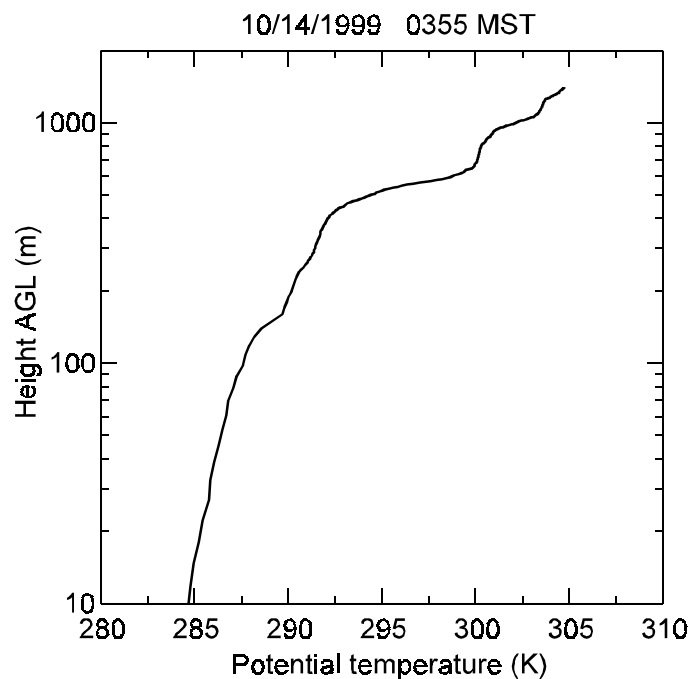


Figure 4. LongEZ potential temperature profile obtained during CASES-99.

VTMX-URBAN 2000

Efforts to analyze the SF₆ bag samplers and mobile analyzer data continue. The bag sampler locations have been checked for accuracy and location descriptions have been updated. The SF₆ bag sample analysis has now been completed and the data have passed the laboratory quality control tests. The data have been sorted by sampler location and the corrected longitude and latitude added. Time history plots for each location are being generated. These plots will be examined for missing or duplicate data points. Any bookkeeping errors discovered will be corrected by referring to the original field records.

(Kirk.Clawson@noaa.gov, Neil Hukari, Roger Carter, Debbie Lacroix)

Model Validation Program (MVP)

Significant progress was made in processing the LongEZ data from MVP Session 4 at Vandenberg Air Force Base. The raw data files from this experiment contain timing errors introduced by the data acquisition software. A set of programs has been developed to correct the majority of these errors. Some of the GPS attitude angle data cannot be recovered, but fortunately this mainly affects the high-frequency end of the angle spectra. The aircraft motion at these higher frequencies is determined from accelerometer data, and not from the GPS angles. (Richard.Eckman@noaa.gov)

WAPEX and SHOWEX

Careful analysis continues on mean wind determination from the BAT probe on the LongEZ for both the Wave Profile Experiment ([WAPEX](#)) and the Shoaling Waves Experiment ([SHOWEX](#)). A number of calibration coefficients are used in the determination of the mean wind based on BAT probe geometry and aircraft attitude. These constants include temperature recovery factor (R_t), angle of attack constants (K_α and K_β), upwash factor (K_{up}), zero lift offset (α_0), adjustment to dynamic pressure (ϵ_q), and pitch, roll, and heading offsets. A small error in one or more of these constants can result in a bias in the mean wind speed and wind direction. A simple procedure (Grossman, R. L., *J. Appl. Meteor.*, **16**, 654-658) is being applied to correct these consistent biases in the wind velocity data from WAPEX and SHOWEX. (Jerry.Crescenti@noaa.gov, Jeff French, and Tim Crawford)

NRC Post-Doc

A National Research Council (NRC) postdoctoral invitation has been extended to Tamara Grimmett (University of California at San Diego) to work at FRD. Tammy is a mechanical engineering student who will work with Jerry Crescenti on air-sea interaction research using the LongEZ data from [WAPEX](#), [SHOWEX](#), and [CBLAST-Low](#). Tammy is expected to finish her Ph.D. work in late June and will be reporting to FRD by early July. (Jerry.Crescenti@noaa.gov)

Cooperative Research with INEEL

INEEL Emergency Operations Center (EOC) Support

A drill was conducted on March 29 to simulate a terrorist infiltration at Power Burst Facility (PBF). NOAA personnel provided support to the INEEL planning bridge to forecast the location of a possible plume resulting from a terrorist explosion at this facility. (Jeff.French@noaa.gov, Kirk Clawson)

INEEL Meteorological Support

A controversy erupted at INEEL on 22 March when seismic alarms were set off at one of the facilities. The alarms were set off not by an earthquake, but by the detonation of a large quantity of plastic explosive by INEEL security personnel. A similar detonation had taken place on the previous day, but without incident. FRD has been asked to investigate the meteorology on each day to determine why the sound propagation differed. The figure shows the temperature profile at 1100 MST on both 21 and 22 March, based on the FRD profiler at INEEL. On the 21st, a well-mixed layer was present up to about 600 m AGL. This temperature structure tends to favor upward refraction of sound waves. On the 22nd, the lower atmosphere was more stably stratified, favoring the ducting of sound near the ground. (Richard.Eckman@noaa.gov)

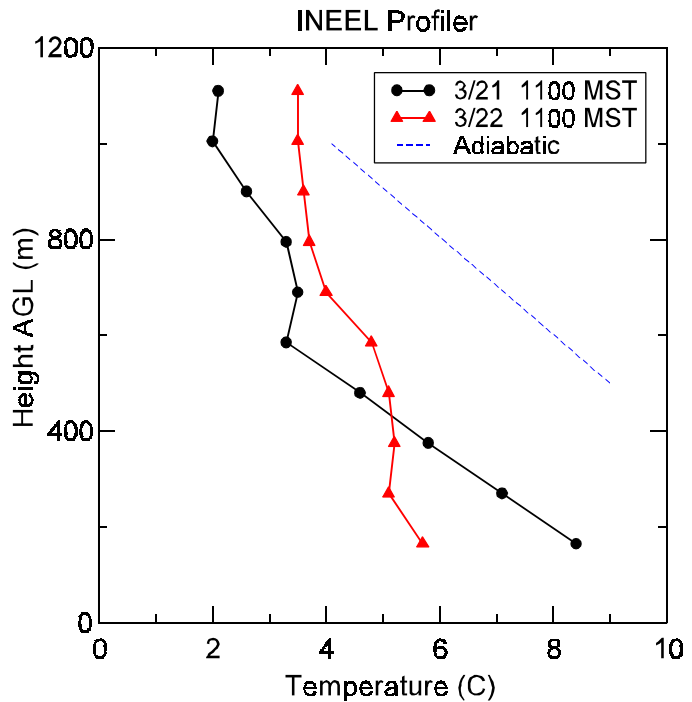


Figure 5. INEEL temperature profiles obtained from RASS system.

In early March, a meeting was held with county commissioners in Jackson, Wyoming, to discuss plans to install a nuclear radiation monitoring station in Jackson. This activity is partly in response to publicity by an environmental group called Keep Yellowstone Nuclear Free (KYNF), which has been making accusations about INEEL contaminating the Jackson area. A KYNF representative at the meeting made a demonstration of turbulent diffusion using an aerosol can, which showed conclusively that the plume concentration really does decrease as you move away from the source. Ironically, this undermined the KYNF claim that nuclear material from INEEL was somehow accumulating in Jackson even though it could not be detected closer to the source. An FRD representative was at the meeting to answer any questions related to transport and diffusion. (Richard.Eckman@noaa.gov)

Other Activities

Columbia River Gorge Study

FRD personnel have become involved in the Columbia River Gorge Visibility and Air Quality Study by presenting a white paper outlining the usefulness of airborne in situ measurements to that project. The aim is to modify the original study plan presented at a workshop earlier this month. Highlighting any aircraft study would be the measurements of particulate

concentration and bulk aerosol optical properties in combination with B-L flow structure in and around the Gorge. (Jeff.French@noaa.gov, Kirk Clawson)

Educational Outreach

Jerry Crescenti was one of several volunteer judges for this year's Science Fair at Sunnyside Elementary School in Idaho Falls. The fair was an all-day affair on March 30. Various presentations were made by students from kindergarten through sixth grade.

In addition to the science fair, Jerry Crescenti also gave a talk to Linda Mabe's Spectrum class, also at Sunnyside Elementary School. Jerry talked about various meteorology instruments and brought in various sensors for a "show and tell" presentation. He conducted several simple experiments with the children including measuring relative humidity using a sling psychrometer.

(Jerry.Crescenti@noaa.gov)

Travel

March 4-8, Tim Crawford traveled to Orlando, Florida, to attend the 55th Interdepartmental Hurricane Conference and the C-Blast Program Planning Meeting.

March 14-15, Kirk Clawson traveled to Cascade Lock, Oregon, to attend the Columbia River Gorge Air Quality Project Peer Review Workshop.

March 5-8, Paula Fee traveled to Boulder, Colorado, to attend the Financial Management Center (FMC) training. While in Boulder she met with MASC Finance, Procurement, Human Resources, Payroll, and Publications personnel.

March 25-27, Rick Eckman traveled to Boulder, Colorado, to attend a CASES-99 workshop at NCAR.

Training

March 6-7, Paula Fee attended training on Financial Management Center in Boulder, CO. This two-day course was presented by OAR's Resource Management Group and members of the Administrative Officer's Council.

Training on TGA operations was conducted on March 26 for those staff members and contractors participating in the AFTAC (GAUNTLET) field project.